TECHNICAL PAPER

STANDARDIZED UXO DEMONSTRATION SITES

PARSONS – EM61/PUSHCART

OPEN FIELD SCORING RECORD NO. 411

The EM61 in the pushcart platform is shown being demonstrated by Parsons at Aberdeen Proving Ground, Maryland.

The EM61 in the pushcart platform was demonstrated by Parsons at the Aberdeen Proving Ground Standardized Demonstration Site's Open Field Area. This technical paper contains the results of that demonstration. This is a reference document only and does not serve as an endorsement of the demonstrator's product by the US Army or the Standardized UXO Technology Sites Program.

For more information

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Technologies under development for the detection and discrimination of unexploded ordnance (UXO) require testing so that their performance can be characterized. To that end, Standardized Test Sites have been developed at Aberdeen Proving Ground (APG), Maryland and Yuma Proving Ground (YPG), Arizona. These test sites provide a diversity of geology, climate, terrain, and weather as well as diversity in ordnance and clutter. Testing at these sites is independently administered and analyzed by the government for the purposes of characterizing technologies, tracking performance with system development, comparing performance of different systems, and comparing performance in different environments.

The Standardized UXO Technology Demonstration Site Program is a multi-agency program spearheaded by the U.S. Army Environmental Center (USAEC). The U.S. Army Aberdeen Test Center (ATC) and the U.S. Army Corps of Engineers Engineering Research and Development Center (ERDC) provide programmatic support. The program is being funded and supported by the Environmental Security Technology Certification Program (ESTCP), the Strategic Environmental Research and Development Program (SERDP) and the Army Environmental Quality Technology Program (EQT).

DEMONSTRATOR'S SYSTEM AND DATA PROCESSING DESCRIPTION

Parsons will locate and flag detectable anomalies at the Standardized Test Sites (except the Active Response Area) using electromagnetic (EM) detection systems. Locations of detected anomalies will be surveyed and results reported on "dig sheets".

Parsons will mobilize two, two-man EM crews to APG with a geophysicist, and safely locate detectable anomalies using electromagnetic systems (Geonics EM61-MKII) within the Standardized UXO Technology Demonstration Site at APG. As each anomaly is detected, its location will be marked by a pin flag.

A two-man Survey Crew will next survey the flagged locations of detected anomalies using a Real-Time Kinematic (RTK) Global Positioning System (GPS) instrument. Locations will be recorded in Universal Transverse Mercator (UTM) coordinates on the Standardized UXO Technology Demonstration Site Program Reporting Spreadsheets (Dig Sheets). The Survey Crew will use a Trimble 5700 RTK-GPS survey instrument in the Open Field.

Performance Summary

Results for the Open Field test broken out by size, depth and nonstandard ordnance are presented in table below. Results by size and depth include both standard and non-standard ordnance. The results by size show how well the demonstrator did at detecting/discriminating ordnance of a certain caliber range. The results are relative to the number of ordnance items emplaced. Depth is measured from the geometric center of anomalies.

The Response Stage results are derived from the list of anomalies above the demonstrator-provided noise level. The results for the Discrimination Stage are derived from the demonstrator's recommended threshold for optimizing UXO field cleanup by minimizing false digs and maximizing ordnance recovery. The lower 90 percent confidence limit on probability of detection and Pfp was calculated assuming that the number of detections and false positives are binomially distributed random variables. All results have been rounded to protect the ground truth. However, lower confidence limits were calculated using actual results.

Summary of Open Field Results for EM61

Metric	Overall	Standard	Nonstandard	By Size			By Depth, m		
				Small	Medium	Large	< 0.3	0.3 to <1	>= 1
RESPONSE STAGE									
P_d	0.55	0.60	0.45	0.45	0.55	0.65	0.65	0.50	0.25
P_d Low 90% Conf	0.50	0.56	0.37	0.41	0.49	0.58	0.62	0.44	0.18
P_d Upper 90% Conf	0.57	0.65	0.49	0.52	0.61	0.73	0.72	0.57	0.34
P_{fp}	0.45	-	-	-	-	-	0.40	0.45	0.45
P_{fp} Low 90% Conf	0.41	-	-	-	-	-	0.38	0.42	0.28
P_{fp} Upper 90% Conf	0.45	-	-	-	-	-	0.45	0.48	0.62
BAR	0.10	-	-	-	-	-	-	-	-
DISCRIMINATION STAGE									
P_d	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P_d Low 90% Conf	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P_d Upper 90% Conf	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P_{fp}	N/A	-	-	-	-	-	N/A	N/A	N/A
P_{fp} Low 90% Conf	N/A	-	-	-	-	-	N/A	N/A	N/A
P_{fp} Upper 90% Conf	N/A	-	-	-	-	-	N/A	N/A	N/A
BAR	N/A	-	-	-	-	-	-	-	-

Response Stage Noise Level: 0.90
Recommended Discrimination Stage Threshold: N/A

Note: *The recommended discrimination stage threshold values are provided by the demonstrator. No discrimination algorithm was applied. Therefore, the discrimination stage results are not applicable.*

To view the full Scoring Record for this demonstration and for all other demonstrations conducted at the Aberdeen and Yuma Proving Grounds in support of the Standardized UXO Technology Demonstration Sites Program please visit our Web site at: www.uxotestsites.org.